

## Supplementary Video Legends

Supplementary Video 1. Spatial maps of frequency of occurrence for the tumors with mutations in key driver genes, including *EGFR*, *NF1*, *PTEN*, and *TP53*: this video visualizes the 3D reconstruction of the regions of spatial location atlases (Figure 2, the right-hand side atlases in panel (A)) with most likelihood of occurrence of mutations in *EGFR*, *NF1*, *PTEN*, or *TP53* genes or their combinations. The color coding in the video is similar to those in Figure 2, panel (A).

Supplementary Video 2. Spatial maps of frequency of occurrence for the tumors with mutations in key driver pathways, including *RTK*, *MAPK*, *PI3K*, and *P53*: this video provides a visualization of the 3D reconstruction of the regions of spatial location atlases (Figure 2, the right-hand side atlases in panel (C)) with most likelihood of occurrence of mutations in *RTK*, *MAPK*, *PI3K*, or *P53* pathways or their combinations. The color coding in the video is similar to those in Figure 2, panel (C).